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Preliminary Individual Comments from Dr. Lee Benda on the Scientific and Technical Basis of the Proposed Rule Titled “Definition of ‘Waters of the United States’ Under the Clean Water Act”

(August 18, 2014)

Dr. Lee Benda

Preliminary Written Comments on proposed new CWA rule.

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Overall comment.

Overall, the EPA has written a very good comprehensive overview of the new CWA rule, including numerous explanatory details, that reflects the amount and care of the effort involved, including the scientific literature review (Report), the SAB’s review of that document, previous and existing rules and case law. In total, I would say that the proposed new CWA rule largely reflects the state of the science as articulated in the EPA Connectivity Report and as reviewed and enlarged in the SAB panel review. However, there are several areas in the proposed rule that could be strengthened.

In addition, it appears that the Connectivity Report that is cited in the proposed rule is the original one reviewed by SAB and not a revised version in response to SAB comments. Hence, some of the text in the rule regarding scientific evidence may change in subsequent rule versions.

Question 1. *The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean all tributaries of a traditional navigable water, interstate water, the territorial seas, or impoundment. This definition is based on the conclusion that a significant nexus exists between tributaries (as defined in the proposed rule) and the traditional navigable waters, interstate waters, and the territorial seas into which they flow. Please comment on the adequacy of the scientific and technical basis of this proposed definition.*

A key element in the determination that all tributaries to all navigable rivers (including desert ephemeral headwater channels) have a significant nexus to larger downstream (navigable) waters is that they must be considered in aggregate, as a population (although the distinction between individual tributary effects and aggregate tributary effects in the science literature review, including in Appendix A, is vague). Although this aspect of channel networks was discussed and embraced by the SAB, even suggesting that EPA create a separate section covering this topic in their Connectivity Report, it appears that the aggregate concept (for wetlands specifically, but which EPA extends to tributaries and neighboring waters) also originates from Justice Kennedy’s Opinion in *Rapanos*, in that they (wetlands)

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are jurisdictional, if they “either alone or in combination with similarly situated wetlands in the region, significantly effect...navigable waters”. However, Justice Kennedy wrote that there needs to be “some measure of significance of the connection for downstream water quality”.

The proposed CWA rule uses various terms to describe the “in combination” aspect of the argument of significantly effecting (e.g., significant nexus), including ‘in combination’, ‘in aggregate’, ‘cumulatively’ and ‘an integrated system’. However, the EPA proposed rule language (and the science argument behind it) could be strengthened by describing in more detail what is meant by the terms ‘aggregate’ and ‘in combination’ (e.g., what is the “measure of significance of the connection for downstream water quality” in the context of aggregate effects). In addition, the aggregate issue that covers both tributaries and neighboring waters may become a touchstone for future challenges or litigation regarding the proposed rule. For example, what proportion of headwater streams would need to be adversely impacted (or eliminated) to create a significant negative impact on larger streams and rivers? Or taken in a larger frame of reference, what is the “measure of significance” in regards to aggregation of tributary effects on the chemical, physical and biological integrity of the nation’s waters, downstream (navigable)?

As we have seen in the public comments, some take issue with the concept that everything is connected to everything else, including in an aggregate sense, and that waters, including headwater tributaries, should be considered on an individual basis (e.g., such as desert ephemeral channels that are only activated once per decade or even at a lower frequency).

The EPA may consider this issue and thus could include more detail about the scientific basis of the “aggregate” concept and how it can be determined (briefly summarized from the Connectivity Report and the SAB review or even expanded upon). The aggregate function of smaller tributaries to the mainstem rivers in regards to water, sediment, organic material and nutrients is well established in the scientific literature, conceptually and quantitatively. However, calculating the effect of a single headwater tributary or water body on a larger downstream system (which may be negligible) or calculating a threshold regarding the number, or proportion, of impaired tributaries on the full functionality of a downstream system may lie outside of present science capabilities (although simulation modeling offers an avenue to address this issue).

I think it is fair to say, in stating the scientific basis for aggregate effects in the proposed rule, that there is a sound scientific basis that tributaries, in aggregate (including ephemeral, intermittent and perennial), lead to significant nexus and that it is not speculative nor insubstantial. However, given the stochastic and episodic nature of the connections between tributaries and larger (navigable) rivers, it is not currently feasible to estimate thresholds regarding the effect of various proportions of impaired/non impaired tributaries on conditions of downstream waters; thus, all tributaries fall under the jurisdiction of the waters of the United States. This argument would also be extended to neighboring waters (wetlands, ponds, oxbows) that occur in riparian areas and in floodplains. However, there should be some effort to articulate the strength of these connections (in aggregate) and how they are determined in the Scientific Evidence (Appendix A). In addition, some editing might be in order such as including

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“aggregation”, in addition to “connectivity” as one of the foundational concepts in hydrology and freshwater ecology.

The proposed rule states that “...the tributary connection may be traced using direct observation or US Geological Survey maps, aerial photography or other reliable remote sensing information...”. I would add to this “the use of digital elevation or terrain models (DEMs, DTMs) of the highest resolution available in conjunction with flow routing algorithms to generate synthetic river networks...”.

2. The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean all waters, including wetlands, adjacent to a traditional navigable water, interstate water, the territorial seas, impoundment, or tributary. This definition is based on the conclusion that a significant nexus exists between adjacent water bodies (as defined in the proposed rule) and traditional navigable waters, interstate waters, and the territorial seas. Please comment on the adequacy of the scientific and technical basis of this proposed definition.

The issue raised about aggregate effects, in the context of significant nexus, in Question #1 also applies to Question #2 regarding all waters adjacent to rivers and tributaries.

Regarding adjacent waters, the rule states “...the agencies will also assess the distance between the water body and the tributary in determining whether or not the water body is adjacent.” As the EPA indicates in the proposed rule, this issue is ambiguous and sets the stage for confusion and disagreement. There should be some measure of quantification (hydrologic connectivity) that is easily measured (in the field or using remote sensing) to reduce the ambiguity.

3. The proposed rule has defined Waters of the U.S. under the jurisdiction of the Clean Water Act to mean, on a case-specific basis, other waters including wetlands, provided that those waters alone, or in combination with other similarly situated waters, including wetlands, located in the same region, have a significant nexus to a traditional navigable water, interstate water, or the territorial seas. Please comment on the adequacy of the scientific and technical basis of this proposed definition.

The proposed rule states “...where effects will be analyzed in combination, the agencies will aggregate these effects...”. This statement is unclear on its own and it raises the issues outlined in my comments in Question #1 about aggregate effects. This same issue comes up again in the proposed rule “...the agencies would assess the combined effects of similarly situated “other waters” in the region on the chemical, physical and biological integrity...”.

The use of Level III ecoregions may be appropriate for their use in defining areas where “waters are similarly situated and aggregation could be used (Map A in docket). However, it might be prudent, unless a more comprehensive analysis is done, to not provide such lists. Rather, it might be best to

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provide the criteria upon which to consider “aggregation”. However, the issue of “aggregation could be used” raises the complexities outlined in responses to Question #1. For example, how exactly would “aggregation” be done (e.g., conceptually, qualitatively or quantitatively)?

The term “landscape unit” is used in the context of aggregate effects and relates to similar hydrologic features and processes, or proximity of features. The EPA could consider using another term, rather than ‘landscape unit’ that is somewhat ambiguous, and in keeping with the science, may use terms such as similar hydrologic or geomorphic feature having similar processes.

The proposed rule in several areas raises the issue of a “desktop” analysis, presumably using remote sensing and digital data (including DEMs). The rule language might be strengthened if more definition or examples were provided of what constitutes a ‘desktop analysis’.

4. The proposed rule defines other terms and excludes specified waters and features from the definition of Waters of the U.S. Please comment on the adequacy of the scientific and technical basis of the other definitions and exclusions.

Overall, I think the addition of key definitions in the proposed rule is necessary and important. I agree with most definitions as written. However, there are a few that could use some editing.

“The term riparian area means an area bordering a water where surface or subsurface hydrology directly influence the ecological processes and plant and animal community structure in that area.” This definition could be tightened up by including “...where surface or subsurface hydrology directly related to channelized flow or the associated alluvial aquifer (including hyporeic zone) directly influence...”.

“...wetlands, lakes and ponds are tributaries (even if they lack a bed and banks or ordinary high water mark...” . As EPA in the proposed rule later acknowledges, the definition of wetlands, lakes and ponds as tributaries (in the case where tributaries and other waters are contiguous or overlapping such as in headwaters) may be problematic. I concur, since tributaries in the scientific literature have a specific physical description as does wetlands and ponds. I would propose that such wetlands, lakes and ponds be named something else, such as “instream wetlands”, “instream ponds” etc., or some other naming convention that clearly classifies these features.

Riparian areas, as defined in the rule, could exclude those areas that strongly influence aquatic systems (regulated waters) through the flux of solar radiation, woody material and litterfall; the zone of influence is generally considered equivalent to the height of riparian vegetation, regardless of hydrological influences.

Regarding the definition of floodplains and how flood frequency (or other event frequency such as mudflows) can be used to delineate floodplains, one approach is to choose the process and frequency that dominantly controls the channel morphology in the area of interest. In lower gradient (<0.01) and

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larger channels, this might be the 2-year flood. In higher gradient channels with boulder beds, the channel forming flood recurrence interval may be on the order of 10-years or longer. In steeper headwaters prone to debris flows, the scour line associated with those events would define the zone of interest. This approach would be similar to what the EPA proposes, but would extend it to include event frequency - morphological dependency and non fluvial events that shape channels.

In the proposed rule there is discussion about the uppermost extent of channels or where a channel begins. The rule should include some discussion that in some landscapes (semi arid and even humid) that channel head locations can be transient. Channel heads and thus the uppermost extent of channel networks can extend upwards (by gully erosion) post wildfire or during very large storms. During a hiatus of fire or storms, the upper extent of channels can be reduced. In this context, gullies = channels, by definition.

The proposed rule states "...absolutely no uplands located in riparian areas and floodplains can ever be waters of the United States...". By definition, uplands cannot be floodplains. If I understand this wording correctly, floodplain landforms can encompass higher areas of land (uplands) that will never fall under the waters of the US rule. Perhaps, this distinction could be made clearer in the rule.

The use of the term "watershed" to inform spatial relationships between tributaries, adjacent waters and other waters and larger (navigable) rivers is appropriate. EPA indicates that this spatial scale will often be HUC 10 digit (5th field) and I would suggest that they provide an example of river place names and areas associated with this watershed scale. For example, HUC 5th field areas are on the order of 225 mi² (40,000 – 250,000 acres) or 160 to 1,000 km².